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‘You started something ... then I continued by myself’: a qualitative study of physical activity maintenance

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Background: Most mid-life and older adults are not achieving recommended physical activity (PA) targets and effective interventions are needed to increase and maintain PA long-term for health benefits. The Pedometer And Consultation Evaluation (PACE-UP) trial, a three-armed primary care pedometer-based walking intervention in those aged 45–75 years, demonstrated increased PA levels at 12 months. A three-year follow-up was conducted to evaluate long-term PA maintenance, including a qualitative component. **Aim:** To examine facilitators and barriers to PA maintenance in mid-life and older adults previously involved in a PA trial. **Method:** Semi-structured telephone interviews were conducted with 60 PACE-UP participants across all study arms. Interviews were audio-recorded, transcribed verbatim and coded independently by researchers, prior to thematic analysis. **Findings:** Two-thirds of participants felt since the PACE-UP trial they had an awareness of PA, with the pedometer reported as ‘kick-starting’ regular activity, and then helped them to maintain regular activity. PA facilitators included: maintaining good health, self-motivation, social support and good weather. Lack of time was the most frequently cited barrier. Other barriers were often the inverse of the facilitators; for example, poor health and bad weather. Participants described the type of ‘top-up’ intervention they would find beneficial to aid PA maintenance (eg, text messages, online resources and walking groups). **Conclusion:** A challenge for future PA interventions is to transform barriers into facilitators; for example, educating trial participants about the value of PA for many chronic health conditions to change this from inhibiting to promoting PA. Participants provided ideas for encouraging PA maintenance which could be incorporated into future interventions.

Key words: Physical activity; walking; maintenance; qualitative; barriers and facilitators

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Introduction

Adults who engage in regular physical activity (PA) have lower rates of diabetes, obesity, hypertension,

depression, stroke, cardiovascular disease and premature death (Lee *et al.*, 2012). For adults and older adults the recommended level of PA is at least 150 min of moderate-to-vigorous physical activity (MVPA) or 75 min of vigorous PA weekly, or a combination of both, which can be achieved in 10 min bouts [World Health Organisation, 2010; Department of Health (DoH), 2011]. Levels of PA decrease with age. This is pertinent issue as

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PA can also help prevent loss of independence, frailty and cognitive decline in older adults (Mcgowan *et al.*, 2017). A total of 71% of men and 66% of women aged 35–44 report meeting the DoH recommendations; however, by the age of 65–74 this falls to only 58% of men and 52% of women (Health Survey for England, 2012). Objective PA measurements suggest that in reality far fewer people are meeting these recommendations (Health Survey for England, 2008).

Walking is considered one of the best forms of PA; it is convenient, low impact, and develops and sustains physical fitness (Morris and Hardman, 1997). Trials have demonstrated the success of pedometer interventions for increasing walking (Bravata *et al.*, 2007; Harris *et al.*, 2015; Harris *et al.*, 2017). However, little is known about the long-term sustainability of interventions which aim to promote PA, with a meta-analysis (Hobbs *et al.*, 2013) and Cochrane review (Richards *et al.*, 2013) calling for more trials with longer follow-up. There is evidence that PA disengagement typically occurs about six to seven months after an intervention has ended (Martin and Sinden, 2001; Hillsdon *et al.*, 2005). For PA to result in sustained health benefits it needs to be practised on an ongoing basis (Reiner *et al.*, 2013); therefore greater emphasis needs to be placed on interventions which promote PA maintenance. There is no accepted definition of post-trial PA level maintenance (Kahlert, 2015). One frequently used definition of successful maintenance is participating in regular PA for six months post-intervention (Rhodes *et al.*, 2008). We extend this definition to include what people are doing/can do to remain physically active in the longer term (ie, beyond the six months usually referred to).

Whilst several studies have explored the features of interventions associated with the long-term effectiveness of PA interventions (O'Brien *et al.*, 2015) there has been very little research exploring the specific factors that motivate individuals to sustain PA post-intervention. Previous research into these factors has focussed on the barriers and facilitators to engaging in PA (Horne and Tierney, 2012; Mailey *et al.*, 2014; Alvarado *et al.*, 2015; Martins *et al.*, 2015). Additional research to distinguish what factors lead to successful and unsuccessful PA maintenance has been recommended (Marcus *et al.*, 2000; Boutelle *et al.*, 2004).

Background to the Pedometer And Consultation Evaluation (PACE-UP) trial and three-year follow-up

PACE-UP was a three-arm randomised control trial undertaken in seven general practices in South West London, United Kingdom. It recruited between October 2012 and October 2013, with 12-month follow-up completed by October 2014. The aim was to increase PA levels in inactive patients (those not achieving current UK PA guidelines) aged 45–75 years, using a complex intervention based on pedometer step-count feedback with and without practice nurse PA consultations (Harris *et al.*, 2017).

One intervention arm ($n=346$) received a pedometer and diary and three individually tailored PA practice nurse consultations towards following a 12-week walking-based programme using behaviour change techniques such as self-monitoring, goal setting, boosting motivation and anticipation of setbacks. The second arm ($n=339$) were posted out a pedometer, PA handbook, a diary and written instructions for a 12-week pedometer-based walking programme, based on individual baseline blinded pedometer step-count. There were no meetings with the practice nurse in this arm. Both intervention arms were asked to post back completed diaries after the three-month intervention. The control arm ($n=338$) continued with their usual PA. After the 12-month follow-up, the control arm participants were offered the intervention; 66% chose to have the pedometer, handbook and diary posted to them and 20% opted for a nurse appointment to discuss their PA, where they also received these materials.

Results at 12 months showed that participants in the nurse and postal arms achieved statistically and clinically significantly higher levels of PA both in terms of step-count and accelerometer-assessed minutes spent in MVPA compared with the control group, and that there was no significant difference in PA levels between the two intervention arms. However, the nurse group had significantly greater confidence in their ability to exercise compared with the other two groups; this may be an important factor in longer-term PA maintenance (Harris *et al.*, 2017). After the 12-month follow-up, qualitative work explored the initial barriers and facilitators to increasing PA levels for participants in both intervention arms (Normansell *et al.*, 2014). Important barriers

identified included poor physical health, mistrust of monitoring equipment, an inflexible routine, work and other commitments, and bad weather. Facilitators included desire for a healthy lifestyle, a flexible routine, social support and a belief in the importance of PA for health.

Three-year follow-up qualitative evaluation

Aim of the study

The three-year PACE-UP follow-up, conducted from October 2015 to November 2016, aimed to determine whether participants' PA levels had been sustained beyond 12 months.

The aim of the qualitative evaluation was to examine the facilitators and barriers associated with PA maintenance three years post-intervention and to explore what resources could aid PA maintenance.

Methods

Sampling and recruitment

The trial statistician randomly sampled the three trial arms for participants who had completed a three-year follow-up and had consented to be approached for interview. Although aware of which group the participant was in, the interviewers were blinded to participants' PA levels both during the trial and at three-year follow-up.

Participants were contacted via email and telephone to arrange a telephone interview with either CW or CB. Prior to the interview, participants were reminded of consent to be interviewed, assured of anonymity and confidentiality, and reassured that they were free to stop the interview at anytime without providing a reason. If happy to continue, consent was then sought for the interview to be audio-recorded. Stratification within each of the participant groups ensured that the interview sample included both genders and represented a range of ages and ethnicities. On completion of the interview, participants were offered a £10 high-street gift voucher to thank them for taking part.

Interview schedule

The interview schedules were developed through discussions with the qualitative team (TH, CW, CB, CV and RN). There were slight

differences between the questions asked to the intervention groups (postal and nurse) and to the control group participants (see Appendix 1). After the first few interviews, recordings were shared with the team and interview questions were refined to include some open questions and to make some questions clearer.

Analysis

Interviews were transcribed verbatim by an external source, checked for accuracy and potential identifying features were removed. Early transcripts were circulated to the research team to ensure consistency between the interviewers and to help assess when data saturation had been reached. The data were then analysed using thematic analysis (Braun and Clarke, 2006). The analysis took a semantic approach with the themes identified using the 'explicit or surface meanings of the data' (Braun and Clarke, 2006: 84) and did not attempt to provide an in-depth conceptual description and understanding, therefore staying 'closer' to the data obtained (Neergaard *et al.*, 2009). Transcripts were read repeatedly by CW and CB and coding was initially of phrases or words which captured the participant's feelings about the trial. Where there was consensus about the emerging phrases or words they were clustered in themes. An inductive approach was used to see which themes arose naturally from the data, rather than having prescribed categories.

Findings

Between March and April 2016, 105 participants were randomly selected, 96 were contacted and all agreed to participate.¹ Telephone interviews were arranged and undertaken with 60 participants (20 from each-arm of the trial). Although data saturation was achieved before completing the 60 interviews, recruitment continued to ensure views from participants of different demographic profiles. Of those recruited 70% were aged 60–75 years old, 62% female and 87% White. Interviews lasted between 4 and 22 min (median 10 min, mean 11 min). One participant had difficulty hearing, so they were emailed the questions to complete.

¹ Nine participants were not contacted as the target number of participants had already been recruited and data saturation reached.

Two key themes and related sub-themes were identified from the analyses which will now be presented and illustrated with verbatim quotes (below, with additional supporting quotes in Appendix 2). Participants also reflected on what additional resources they would find useful to support PA maintenance.

Long-term effect of the PACE-UP trial

Within this key theme, three sub-themes were identified (Figure 1); increased awareness, lifestyle changes and pedometer use.

Increased awareness

The majority of participants felt since the PACE-UP trial they had an awareness of PA, regardless of whether they thought the trial had actually changed their PA levels. Some participants described developing an awareness of the importance of PA and how much PA they should be doing:

I think it's made me more aware of the need to walk more but discipline the PACE-UP trial has provided I suppose, in terms of monitoring how many steps I do per day, and what you actually need to do to achieve that number of steps per day, it's made me more aware of the need to actually commit to doing some exercise a day, just strolling around the house, and going to the shops occasionally doesn't really make much difference. It doesn't meet the sort of threshold that you need to reach to ensure that you lead a healthy lifestyle, so I think it's the discipline of PACE-UP has had an effect on my perception of health and wellbeing.

(Male, aged 56, white British, postal group)

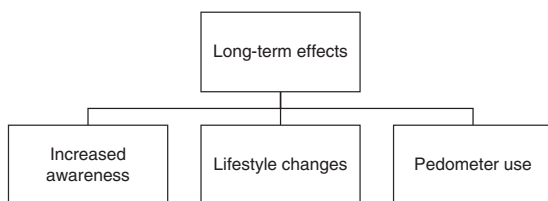


Figure 1 Three sub-themes relating to the long-term effect of the PACE-UP trial

Others described having a better understanding of the amount and intensity of PA needed to meet the guidelines and how this can be built up gradually over the day:

... it has given me a lot of insight and support really, doing small amounts of physical activity regularly has been you know/having the pace-o-meter on ... it made a huge difference as opposed to the mind set of, oh, I've got to do an hour in the gym. Actually 10 minutes solid walking somewhere, several times a day, actually builds stuff up it's given me insight and therefore changed the mindset ... its actually also given me confidence ... and support in a curious kind of way. I just feel, when I'm down, and I think oh God, I'm too tired to do anything, it actually boosts me on that kind of level, on the motivational level.

(Female, aged 69, white British, nurse group)

Lifestyle changes

Participants attributed a number of positive lifestyle changes to being involved in the PACE-UP trial, including walking rather than using motorised transport, walking during work lunch breaks and walking up escalators:

I make myself walk more than I did before because it was very easy to you know catch the bus and come back on the bus, whereas now I rarely catch the bus down [the hill]. I'm always walking.

(Female, aged 63, white British, postal group)

Well it just sort of sprung me in to action with regard to doing a little bit of walking every day, so I try to incorporate at least 10 minutes, but ideally at least 15, at lunch time ... I'll just mosey around the block a couple of times from work and it has made me feel a lot better.

(Female, aged 60, white Irish, postal group)

There was some indication that these lifestyle changes were sustainable in nature:

[PACE-UP] just reinforced the importance of just keeping up the exercise and just being aware

that it's a lifelong thing now. We'll just continue like this. Yes, that's what we'll do really.

(Male, aged 53, white British, postal group)

Whilst some participants used the above strategies to integrate healthy behaviours into their lifestyle, others explained that an inflexible routine, and a preference for sedentary activities, prevented a positive walking habit formation:

I'm/not exactly inactive, but as soon as I get home from work, the feet go up and you know that's it. I don't go anywhere unless I really have to.

(Female, aged 61, white British, postal group)

Pedometer use

Participants had differing views towards the effectiveness of the pedometer intervention for aiding PA maintenance. For some, they felt using the pedometer helped 'kick-start' regular PA:

Well, before the PACE-UP trial I had no incentive. And that really did help me. That put me/gave me the first steps as it were, got me on the right track, and then going to the gym and getting somebody there who could set out a routine for me and encourage me and things, next step, and then got the Fit Bit as well at Christmas, and then that's really helped.

(Female, aged 51, unknown, nurse group)

The participants continuing to use the pedometer post-intervention found it a useful motivational tool for goal setting and self-monitoring:

I try to ensure that I reach 10000 a day, although I don't always do/achieve that, but I know that that's my benchmark and therefore if I fall below it I believe I haven't done enough exercise for that day.

(Male, aged 56, white British, postal group)

For others, they felt using the pedometer increased PA initially but reported the 'novelty' of wearing it had worn off. Participants stopped wearing the pedometer for numerous reasons including finding it inconvenient or inaccurate.

I think it made me more aware of walking as a means of health and I was very interested to count how many paces I did per day, that was quite fascinating to count and watch/it's quite addictive isn't it, counting ... on a long-term basis I can't keep wearing that thing all the time, it irritates me to wear it and I forget to switch it on and it doesn't work as a practical method.

(Female, aged 50, white British, postal group)

A minority of participants stated that using the pedometer had a negative impact on them psychologically. Participants commented on feeling demoralised and 'like a failure' (Male, aged 63,

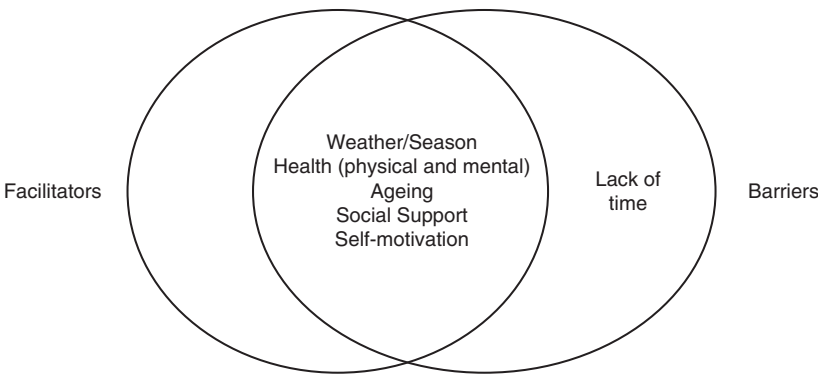


Figure 2 Barriers and facilitators to physical activity maintenance

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white British, postal group) if they had not managed to meet each daily step target:

It doesn't motivate me to do more, but it makes me feel guilty for not doing more.

(Male, aged 56, white British, postal group)

However, although some participants were no longer using the pedometer provided as part of the PACE-UP trial, a few reported using other PA monitoring devices such as mobile phones and Fit-Bits.

I kept forgetting to put the pedometer on, but I always had my phone on me, so I thought well I'll just use my phone. So it made more sense because I've got it handy. And then, when I do go for a walk, it's nice to have it on me ... rather than another piece of equipment

(Female, aged 52, white other, control group)

Facilitators and barriers to PA maintenance

Most of the themes relating to the facilitators and barriers to maintaining PA were the inverse of each other; these included weather/season, health, self-motivation, ageing and social support. Time, was the only theme described as a barrier to maintaining PA and not a facilitator (Figure 2).

Weather and season

For many participants, the weather and season were important factors linked to PA motivation and engagement.

It depends on the weather for me ... when the weather is fantastic and you wake up and the sun is shining, I can't wait to get out, and then on the days when you wake up and it's so grey, the mood just isn't there.

(Female, aged 63, Caribbean, nurse group)

For some, bad weather prevented undertaking PA, whilst for others PA was guided by the season:

I toyed with the idea of walking in to XXXXX yesterday and I certainly had the

time but the rain came down and it put me off.

(Male, aged 64, white British, postal group)

Health (physical and mental)

Health was mentioned by many as a reason for continued engagement in PA. Participants cited the following physical health motivators: keeping fit; preventing long-term health conditions; managing existing health conditions; keeping in shape; losing weight; and helping with an injury. Whilst some participants spoke about general health-related benefits of PA others spoke about specific ailments:

The more active I am, the better the arthritis is, so I know if I've sat down for even more than half an hour, when I get up, I'm stiff, so I know to keep myself lubricated. I need to be walking as much as possible and that's why I swim as well, so that's my main motivation really, is to just keep the joints as lubricated as possible.

(Female, aged 61, white Irish, postal group)

Participants also spoke about the mental health benefits of PA and how PA makes them *feel better*, more alert and have a more positive outlook on life.

Physical activity, it's important, not only for things like weight control, but also for things like reducing the ageing process, but also keeping your mind physically active and ... having a better positive view of life, so having a physical exercise routine doesn't just improve your physical well-being, but it does improve your mental well-being ... I certainly do feel more mentally alert and I feel happier after having done some exercise, so I think that's the take-away for me from the PACE-UP trial is the acknowledgement or the understanding that keeping up some sort of physical routine is good obviously physically, but also good mentally.

(Male, aged 56, white British, postal group)

Having physical limitations was also cited as a barrier to PA. For some this was linked to specific health conditions such as arthritis, whilst for others

it was the general aches and pains related to ageing that limited PA:

I've got an ongoing problem where I get pain, so there's no way I'm going to be going out walking if I don't have to.

(Female, aged 61, white British, postal group)

Concerns about possible adverse health events as a consequence of increasing PA was also seen as a barrier to engagement. One participant was unsure of the safest way to increase their activity levels as they got older and felt there needed to be better advice and guidance:

... I'm just a little bit afraid of becoming more active, simply because you feel that, well, I'm doing quite well with what I'm doing, so what's the point of sort of having a risk of a heart attack or something like that, suddenly break in to a stride and start running, so maybe a bit of guidance on what's going to happen to you if you do step up your exercise plan.

(Male, aged 67, white British, postal group)

Self-motivation

Many participants cited self-motivation as an important reason for engaging in PA and a few explained that it was the PACE-UP trial that had provided them with self-motivation.

You started something and then I continued by myself

(Female aged 56, white British, control group)

Whilst some participants reported having the resources (park, gym, etc.) to be active they explained the main barrier to not participating in activity was a lack of self-motivation.

In my area things the resources are there it is just for me to be a bit more committed, a bit more motivated, to do it.

(Female, aged 57, Asian other, control group)

For some, lack of self-motivation was linked to a misconception about the long-term benefits of engaging PA and potential health outcomes:

If somebody turned around to me and said, you're going to have to walk 10000 steps a

day, otherwise you're going to die in two years' time, that might do it, but I haven't got that ... I've got to do this otherwise it's a serious serious thing, because I'm not that unfit. I'm just not doing enough really, you should walk 10000 steps a day, and actually I haven't and I don't and I know I should.

(Male, aged 56, white British, postal group)

Ageing

Some participants placed importance on PA as a way of staying young and active and trying to slow down the ageing process.

... with advancing years, you're more aware that/and as the saying goes, if you don't use it, you lose it, and I'm very much aware of that now.

(Female, aged 73, white British, control group)

A few participants spoke about age as a barrier to PA and how participating in sport had become harder as they got older. For some this was because they found PA 'more of a strain' (Female, aged 59, white British, nurse group).

I used to, you know, play squash and I used to coach rugby and I played hockey and things like that, I don't do those things any more. Sometimes I think I should but it's/as you get older it gets a bit harder to do them.

(Male, aged 59, white British, control group)

Participants had differing opinions over retirement and whether or not having more leisure time would affect PA levels. Some participants saw not working as an opportunity for additional PA, whereas others felt that not having a daily commute would reduce PA levels.

I work between 30 and 40 hours a week still and I don't actually have much time for anything else at the moment, nor do I have a lot of energy left. I am aiming to retire in 18 months, when I'm 70, so one of the things that I want to do is to take up swimming and to do more yoga, so it really/my main

activities are walking, yoga and swimming, when I take it up, again.

(Female, aged 69, white British, nurse group)

I always walked to work and you know and I wasn't quite concerned, but when you retire, you start becoming more relaxed and haven't got the pressure of getting up and doing things straight away, so your lifestyle's more relaxed, hence, you don't do [as much] physical exercise as you think you're doing.

(Female, aged 64, white British, control group)

Social support

Although a few participants stated a preference for solitary activities, many participants spoke about the importance of having friends and family to motivate them to participate in PA. For some, this motivation came from making a commitment to exercise with someone else. For others, social support provided them with confidence to try new activities or encouragement to push themselves further. Support from and accountability to family and friends were therefore seen as common facilitators to PA.

... I do have a friend that I walk with on a Thursday, so I'll say, ooh, I don't really feel like walking today and she'll say, oh come on, get a move on, and she'll/we'll just both say oh shall we walk just a little bit further and we'll walk a little bit further, or you know/or push each other up the hill in a way, so we motivate each other ...

(Female, aged 52, white other, control group)

PA was also seen as an opportunity to meet new people:

There isn't much reward coming from the physical activity, there has to be something else rewarding really ... I think/well the social thing is one thing that actually helps really. That keeps me going to the class.

(Female, aged 69, white British, control group)

Family members were also seen as indirect motivators with some participants expressing a

desire to keep up with younger family members as an incentive to maintain an active, healthy lifestyle.

To remain independent, and I've got nieces and a nephew ... I need to be active to keep up with them because they are young. I just need to keep up with everyone else really. I don't want to slow down and become old. Unfortunately, I'm not really motivated by anything else.

(Female, aged 65, white British, nurse group)

A few participants spoke about how participating in the trial had positively influenced the PA of those around them:

It's been beneficial for me and to friends ... I've got a particular friend that used to never worry about steps, but now talks about steps all the time, and that's partly through my talking about my own experience with PACE-UP.

(Male, aged 56, white British, postal group)

In contrast, not having anyone with whom to participate in activity was seen as a barrier, with participants reporting that lack of social support led to a reduction in walking:

I like walking but my friend that I used to go walking with quite a lot has moved away, so there's not so much incentive now to go for a walk.

(Female, aged 59, white British, nurse group)

Lack of time

Time was identified as a barrier by nearly half of participants, making it the most frequently cited barrier, and was the only theme not identified as a facilitator. Lack of time included being 'too busy', 'family responsibilities' (looking after children, caring for relatives) and 'work commitments'.

To me my reluctance to do physical activity was really based on I'd say laziness ... and if you are working full time ... it takes discipline I think to do things in a time when you're supposed/you should be relaxing after

work, the thought of actually doing physical exercise, which didn't at the time seem to me to be a relaxing activity, but a chore, deterred me from doing any physical exercise really.

(Male, aged 56, white British, postal group)

Even though some participants had a strong sense of self-motivation to participate in PA, time was still the limiting factor to them engaging in this behaviour.

It's not because I don't want to do the exercise, or ... or that I haven't got the motivation to do it, it is just finding time.

(Female, aged 54, white British, nurse group)

Some participants were able to find solutions to having a lack of time, including integrating physical activity into their schedule.

...I do have an issue of time really, which is why I find walking to and from school is quite a good thing because it makes me have exercise and it's killing two birds with one stone, because it's something that needs to be done as well.

(Female, aged 49, white British, postal group)

As seen in a previous quote, others were able to overcome the barrier of time by incorporating multiple short bouts of PA into each day.

Oh I've got to do an hour in the gym. Actually 10 minutes solid walking somewhere, several times a day, actually builds stuff up.

(Female, aged 69, white British, nurse group)

Reflections from trial participants

At the end of the interview participants were asked to comment on what additional support could be provided to aid PA maintenance, and were offered examples which included; text messaging, online resources, annual nurse appointments and walking groups. Participants also provided other useful suggestions.

Annual nurse appointments

Overall participants were positive about the option of seeing a nurse annually to discuss their

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PA. Participants felt having a nurse (or an authoritative figure) to report to regularly would provide 'accountability' and remind them to participate in/undertake/maintain PA levels.

I was probably more motivated through the trial than I was once that stopped, so if I had a regular point/an appointment that meant I checked in with somebody on a regular basis, I'd probably be more motivated, so external accountability has always been quite useful.

(Male, aged 66, white British, nurse group)

Walking groups

Again the role of social support was viewed as helpful to engaging in PA. However, it was important to participants that walking groups included people of similar fitness levels and were at a convenient time.

I suppose maybe if there were walking groups around for people I mean I know there are walking groups, but they're usually for people who are fitter than me.

(Female, aged 68, white British, postal group)

Some participants viewed organised walking groups as too restrictive and would prefer to be part of a group that was 'more spontaneous than arranged' (Male, aged 67, white British, postal group).

Text messages and online resources

Participants had differing opinions over the use of text messages and online resources to encourage PA maintenance, with some having a strong preference for one over the other.

Some participants favoured the idea of being able to go online at their 'own time' (Female, aged 63, white British, control group) to find PA guidance and viewed text messages as 'intrusive' (Male, aged 56, white British, postal group) and a 'nuisance' (Female, aged 52, white other, nurse group).

Others preferred the idea of regular text message reminders to be physically active and felt that they would be less likely to view online resources as that required them to be 'a bit more proactive' (Female, aged 51, unknown, nurse group).

Additional ideas suggested by participants

A few participants spoke about the value of a more holistic nurse consultation, suggesting nurses include advice and information on diet as well as PA:

... if you wanted any thoughts about the trial and how it could be, not necessarily improved, but how it could be adapted slightly to talk about diet as well, because I think that the two go hand in hand, the exercise and the diet.

(Female, aged 50, white British, nurse group)

Others spoke about a need for more opportunities for older people to participate in PA and difficulty with some established activities:

I think it would be good if there was some sort of community, like a walk once a week ..., if you're a bit older, it becomes a little bit difficult to join particular classes.

(Male, aged 56, white British, postal group)

Some participants felt there were no additional resources that could be provided to encourage PA maintenance and that being active was ultimately down to self-motivation.

These days one gets plenty of messages about being physically active. I don't think/if people are not active it's not because they don't know they should be, and that certainly applies to me, out of inertia, laziness, busyness, you know, there are all sorts of reasons why I'm not as active as I could be, but it's not because you don't give me the information or anything like that.

(Male, aged 59, white British, control group)

Discussion

Main findings

This qualitative evaluation identified perceived barriers and facilitators to being physically active three years after participants took part in a PA intervention. An important finding was that the results of each theme were consistent across the three arms of the trial (nurse, postal and control)

with no group differences emerging. Most participants reported an increased awareness of PA as well as an increased understanding about the importance of PA for health and knowledge about the amount of PA required to meet PA guidelines. Participants highlighted different barriers and facilitators to being able to stay physically active in the longer term, which were predominantly the inverse of each other and were similar across the three groups. Important facilitators and barriers included: weather; health; self-motivation; ageing; and social support. Lack of time was the most frequently cited barrier to maintaining PA. Participants provided useful insights on what additional resources could encourage them to stay physically active in the longer term.

Comparison with other studies

To our knowledge, this is the first qualitative study to explore the barriers and facilitators to PA maintenance three years after a PA walking intervention has been delivered.

Interestingly, the majority of barriers and facilitators found in this study were also reported in the previous qualitative exploration of reasons for participating in the PACE-UP trial (Normansell *et al.*, 2014). This provides support for the credibility of our work and suggests that barriers and facilitators may be similar for both PA adoption and maintenance (Tulloch *et al.*, 2013).

Of note, time as a *facilitator* (as well as a barrier) emerged from the 12-month interview data, with participants reporting the benefits of having a flexible routine which allowed them to fit in more PA. In this study, time was the most frequently stated barrier to PA, this is consistent previous research (Kowal and Fortier, 2007; Reichert *et al.*, 2007; Evenson *et al.*, 2008; Costello *et al.*, 2011; Kelly *et al.*, 2016). Whilst we found that time was not identified as a facilitator, some participants were able to find strategies to overcome it as a barrier.

A systematic review, which explored barriers and facilitators to the uptake and maintenance of healthy behaviours by mid-life adults, also reported similar findings to our study. Additional barriers and facilitators identified in the review included; socio-economic status (SES), ethnicity, gender and transport issues (Kelly *et al.*, 2016). Consistent with our findings Kelly *et al.* (2016) also found health to be both a facilitator and a barrier

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to PA. Fear of illness and ageing, previous illness and other health-related issues (eg, weight loss, feel good factor) were recognised as facilitators. Conversely, existing ailments or chronic health conditions were cited as barriers to PA. Whilst we did not find any differences in terms of age, previous studies have found health to be more frequently cited, as a barrier to PA, with increasing age (Booth *et al.*, 1997; Sørensen and Gill, 2008).

Consistent with a study exploring the effectiveness of a pedometer to increase PA in primary care six months post-intervention (Mckay *et al.*, 2009), our participants spoke about the pedometer helping initially until the novelty of wearing it had worn off or until they found other ways to monitor PA.

Social support has been found to be important for both behaviour initiation and maintenance (Mcauley *et al.*, 2003; Floegel *et al.*, 2015). In our study, social support was associated with remaining physically active in the longer term. Other participants spoke about lack of social support being a barrier to PA, explaining they were less likely to engage in PA if they did not have a companion. Kelly *et al.* (2016) included studies that identified social support as a facilitator (Hooker *et al.*, 2011; Babakus and Thompson, 2012) and those that identified lack of social support as a barrier (Im *et al.*, 2013). Whilst we had too few participants from different ethnic groups to comment on important effects, cultural and ethnic differences can help to explain why some people place more importance on social support, in terms of PA, than others. The notion of 'individual-versus family oriented PA' has been well documented in the literature (Berg *et al.*, 2002; Belza *et al.*, 2004). One study found that ethnic minority women place more value on the role of family-orientated activities than white women (Im *et al.*, 2013).

One recurring topic across themes was having someone to report to regularly motivated individuals to participate in PA. Frequent contact with participants during the maintenance phase of an intervention has been found to be important (Marcus *et al.*, 2000); however, little is known about what needs to happen during these contacts, the frequency they need to occur and at what point they can cease and behaviour still be maintained. Participants in our study had differing opinions over what additional support could have been provided to encourage PA. This highlights the need for some aspects of the PA interventions to

be tailored to the individual. Previous research states that for behaviour change to be successful strategies need to be developed by gender, age, risk status, ethnicity and baseline activity (Marcus *et al.*, 2000; Berg *et al.*, 2002; Sørensen and Gill, 2008). Maintenance of PA following the end of an intervention may also be influenced by attitudes and behaviours, as well as pre-existing individual characteristics (Bock *et al.*, 2001).

Strengths and limitations

We were able to recruit and interview a large sample of participants ($n = 60$). Participants included both men and women of varying ages. Everyone who we managed to successfully make contact with agreed to take part in the interview indicating an excellent take-up rate.

Qualitative research is based on researchers' interpretations, and therefore open to researcher bias (Mays and Pope, 1995). The researchers undertaking the analysis were aware of the facilitators and barriers identified from qualitative interviews at 12 months (Normansell *et al.*, 2014). It was important that, while undertaking the data analysis, the researchers avoided the unconscious 'seeing' of data they expected to find (Crabtree and Miller, 1999) and did not force the data into preconceived categories (Charmaz, 2006). We mitigated these risks by conducting the interviews and transcriptions by two researchers working independently (CB and CW). Emergent themes were discussed, circulated to the larger research group and any discrepancies were resolved through discussion. Having the wider team actively involved in the analysis increased credibility and trustworthiness of the data interpretation (Noble and Smith, 2015). Illustrative verbatim quotes are provided for each sub-theme to demonstrate the relationship between the interpretation and the evidence increasing trustworthiness.

Limitations of this research should also be acknowledged. The PACE-UP trial, from which the participants were sampled, was conducted in South West London. Although a diverse area in terms of ethnicity and SES, care should be taken when transferring the findings to a wider context, especially as those interviewed were mostly Caucasian. As with all research, our findings only represent the views of those who consented to be contacted. Whilst we made contact with those

declining to participate in the PACE-UP main trial to explore reasons for non-participation (Normansell *et al.*, 2016), we did not attempt to contact those declining to take part in the three-year follow-up. Our findings therefore only represent those participants that continued with the PACE-UP trial at three years. Participants who did not consent to be interviewed or who dropped out from the follow-up might have differing views and issues surrounding PA maintenance that we were unable to capture. Our exploratory between-group comparisons may also be limited by contamination of the control group after 12 months following all participants being offered a PA intervention.

We acknowledged the potential influence that being aware of the findings from the previous qualitative study, carried out shortly after the PACE-UP intervention was delivered (Normansell *et al.*, 2014), could have had upon our interpretation and analysis. We adopted strategies to mitigate this. However, one further strategy to minimise 'researcher bias' that we would seek to include in future research would be a wider discussion of results with either study participants, experts by experience (those who do/do not exercise) and those involved in service delivery.

We did not attempt to correlate participants' views with any objective measure of PA and interviewed participants without knowledge of their objective PA levels, either earlier on in the trial, or at the three-year follow-up. This was a deliberate decision for a number of reasons; first, PA levels can vary over time and during different seasons; second, we were interviewing participants over a short time period (March to April 2016); whilst their most recent objective PA monitoring from the three-year follow-up could have been anytime between October 2015 and March 2016. Finally, the length of time between providing objective three-year follow-up data and being interviewed differed for different participants.

Implications

Identifying reliable predictors of PA allows researchers and practitioners to structure interventions effectively to influence long-term behaviour change. Given that many participants mentioned an increased awareness of the importance of PA three years post-intervention, the challenge is how to translate this knowledge into sustainable behaviour change.

Future research needs to focus on techniques to overcome barriers to PA. For example, addressing lack of time by better incorporating PA into daily life or by considering strategies for prioritising PA when there are competing sedentary activities. Efforts to overcome lack of time, should consider the DoH guidelines suggesting that the recommended 150 min of MVPA a week can be achieved in bouts of just 10 min or more, for example, brisk walking is a good way of integrating PA into daily life. Many participants in our study attributed positive lifestyle changes to the PACE-UP trial, for example, walking rather than using motorised transport. For those who cited time as a barrier, providing them with examples of how others have successfully integrated PA into their daily routine and made sustained behaviour changes, may be beneficial. Previous research supports this suggestion, demonstrating that PA advice from realistic exercise leaders, or role models in the community, is potentially more effective in encouraging PA participation than advice from unrealistic role models (Allender *et al.*, 2006; Buman *et al.*, 2011).

Participant's had differing opinions over whether retirement would increase or decrease PA levels and this posits whether retirement, as a transitional point in life, could provide a key opportunity to deliver PA interventions to improve health (Baxter *et al.*, 2016). Whilst we did not unpick the relationship between mid-life/older and retired/working individuals it would be interesting to see whether different barriers and facilitators are important for these participant groups.

Another challenge is how to transform PA barriers to facilitators, for example, demonstrating the value of PA for many chronic health conditions to change this from inhibiting to promoting PA. Efforts to increase PA need to focus on increasing awareness and confidence about the levels of exercise and types of activities that are not only safe, but may be beneficial for specific health conditions that become more common as people age (Sharma *et al.*, 2005; Kaewthummanukul and Brown, 2006).

Conclusion

Interviews with 60 participants three years after taking part in a PA intervention revealed that most reported an increased awareness of PA, regardless of whether they had been in one of the

intervention groups or the control groups. They also identified perceived barriers and facilitators to being physically active and provided constructive ideas for encouraging PA maintenance which could be incorporated into future interventions. A challenge for future PA interventions is how to transform barriers into facilitators, for example, educating participants about the value of PA for many chronic health conditions, to change this from inhibiting, to promoting PA.

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Conflicts of Interest

None.

Ethical Standards

Ethical approval for this study was granted by the London (Hampstead) Research Ethics Committee (12L/LO/0219). Trial registration:

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Appendix 1

Example interview schedule for participants in the intervention groups and the control groups.

Intervention group

Main questions

1. Can you tell me about what physical activity you did last week? Was that a typical week for you?
2. Do you think taking part in the PACE-UP trial has changed the physical activity you are doing now?
3. Is there anything about the PACE-UP trial that you particularly remember? *i.e. take home message*
4. Do you still use the pedometer, diary or handbook given to you after the PACE-UP trial? If so, how often do you use them? *If no, do you use anything else? i.e. phone, fitbit.*
5. What normally motivates you to be physically active? Is that different to how it was before you participated in PACE-UP?
6. Would you recommend the PACE-UP trial to family and friends?
7. Are there any additional resources or support that you could suggest that might help to keep you physically active? *i.e. family, friends, text messages, online resources, annual visit to nurse, walking groups*

Closing

That was all the questions I had for you, is there anything else you would like to add or think I've missed?

Control group

Main questions

1. Can you tell me about what physical activity you did last week? Was that a typical week for you?
2. Do you think taking part in the PACE-UP trial has changed the physical activity you are doing now?
3. Is there anything about the PACE-UP trial that you particularly remember? *i.e. take home message*

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4. What normally motivates you to be physically active? Is that different to how it was before you participated in PACE-UP?
5. As a participant in the study you may have received a pedometer, diary and handbook after the main trial was over. Did you find these resources helpful? Have you continued to use any of these resources? *Do you use anything else? i.e phone, fitbit ...*
6. Would you recommend the PACE-UP trial to family and friends?
7. Are there any additional resources or support that you could suggest that might help to keep you 'physically active?' i.e. family, friends, text messages, online resources, annual visit to nurse, walking groups

Prompt sheet

Pedometer use

- In what way do you think using a pedometer influences your physical activity?

Barriers to being physically active

- Are there any barriers or difficulties you've had to overcome when it comes to physical activity?

Motivation

- Do you set yourself any physical activity targets/ goals? *If yes, prompt more.*
- Do you adopt any strategies to help you stay motivated to be physically active? *If yes, prompt more.*

Peer/social support and physical activity

Under question 5 if not discussed.

Closing

That was all the questions I had for you, is there anything else you would like to add or think I've missed?

Appendix 2

Table A1 Themes and sub-themes with additional supporting quotes

Themes	Sub-theme	Evidence
Long-term effect of the PACE-UP trial	Increased awareness	<i>I think it's made me more aware. Well as soon as I started the trial, I started thinking of the physical side of my life, and whether I was umm/you know how much exercise I was doing and umm/so it was informative because I didn't realise that you were supposed to try and get out of breath, once a day. (Female, aged 63, white British, control group)</i>
	Lifestyle changes	<i>My interests are more cerebral really, you know, I was a researcher, I do a lot of reading, I belong to a book club ... I do photography. I suppose that's a bit more active but not a lot more active actually. I'm always doing as much as I can. I could do more if I perhaps dropped my other interests, which I'm not prepared to do. (Female, aged 69, white British, control group)</i> <i>I also realised how fairly easy it is just to build up the steps so today, for example, there are two stations I could have gone to, to come home from where I was and I just walked to station which was furthest away, you know, it's just what I will do and walk up the escalators and underground stations. (Male, aged 66, white British, nurse group)</i>
	Pedometer use	<i>I want to walk more every day but I'm two or three days which sometimes I don't do it, but now I do, so no, it has been a great incentive with the pedometer, it does keep you on track to be healthy (Female, aged 57, Asian other, control group)</i> <i>The pedometer I think probably helped a lot initially, just to encourage me to go, but I've sort of abandoned that because it just is a bit awkward really. (Female, aged 61, white Irish, postal group)</i>

Table A1 (Continued)

Themes	Sub-theme	Evidence
Facilitators and barriers to physical activity maintenance		<i>Sometimes you think you've done more than you have, when you look in your pocket, you think, oh the pedometer's not working (laughs).</i> (Female, aged 64, white British, control group) <i>I felt in competition with myself and I'm not sure that that was a good thing, because I thought I'm trying to walk more than I really need to, just so I can get my figures up.</i> (Female, aged 65, white British, postal group)
	Weather and season	<i>The sun shining is a bit encouraging! ... when you work and when you finish it's dark and before you go to work it's dark, so it's really not a nice time of year to go out and do something and I'm not a person that would go to a gym and stuff like that, so it really is outdoor stuff, so really the spring and the summer.</i> (Female, aged 61, white British, postal group) <i>I mean I'm waiting for the weather to get a bit better to start going out for walks with groups like the Ramblers.</i> (Female, aged 63, white British, control group)
	Health (physical and mental)	<i>I don't want to gain any weight, and my family history has diabetes in it and I know keeping your weight down is a factor, so that's my motivation.</i> (Female, aged 64, Caribbean, nurse group) <i>'I shouldn't just blame everything on my illness that I need to / in spite of my difficulties, I still need to be fit, to be healthy.'</i> (Female, aged 57, Asian other, control group)
	Self-motivation	<i>I think it comes from you. You have to want to do these things don't you ...</i> (Female, aged 65, white British, nurse group)
	Ageing	<i>But you're only as good as your sort of last day I think at my age, which is/something's going to strike me down at some point, but there are things that I can do to help myself, and one of those is exercise.</i> (Male, aged 67, white British, postal group)
	Social support	<i>I go with my friend, so we sort of motivate each other as much as we can ... Yes, it's nice to go with somebody and I think they make you go, you know, it's very easy just to come home and sit down and not go, whereas if you've arranged to go with somebody, I think you're more likely to do it'</i> (Female, aged 54, white British, nurse group)
	Lack of time	<i>I used to absolutely love walking, but also it's the time factor. At the moment I've got a mother who's 90 and I've had to spend a lot of time going around and sorting out carers and different things, so time-wise, I haven't had a lot of spare time.</i> (Female, aged 62, white British, control group) <i>I have a disabled child so I'm a full time carer and sometimes I would feel I really don't have the energy to do that ... because actually it's very difficult, when you're caring for a young child, in particular, to find time, energy, motivation, to do something for yourself and actually it's easier to sit in and eat a big bag of crisps and a huge packet of biscuits.</i> (Female, aged 50, white British, nurse group)
Reflections from trial participants	Annual nurse appointments	<i>If you are having it validated by professionals, I think it's taken more seriously.</i> (Female, aged 57, Asian other, control group)
	Walking groups	<i>If I was part of a [walking] group, if I reported to somebody, I would definitely do it, because I don't really report in to anybody, I'm not part of a group, I don't do it, as much, even though I know the benefits are there.</i> (Female, aged 62, white British, nurse group)
	Text messages and online resources	<i>I think you need little reminders, little jolly reminders, probably quite a good thing, I think anything with a/like a positive message, yes, is very helpful</i> (Female, aged 52, unknown, nurse group)